

**Bay Area Air Quality Management District**

**939 Ellis Street  
San Francisco, CA 94109**

**Staff Report**

**FURTHER STUDY MEASURE 8**

**Atmospheric Blowdown Systems**

**November 28, 2005**

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## **I. INTRODUCTION**

### **A. Summary of Proposal**

District staff has determined that it is not necessary to initiate rulemaking to control emissions from refinery blowdown systems (BDS) because the inputs to those systems are already regulated. Blowdown systems at all but one refinery in the Bay Area Air Quality Management District are currently vented to a flare or fuel gas recovery system. The one refinery with uncontrolled, or atmospheric, blowdown systems is the Tesoro Refinery in Contra Costa County. Staff has analyzed the four atmospheric blowdown systems at the Tesoro Refinery and has determined that the inputs to those systems are subject to existing District rules and that additional controls on the blowdown systems themselves would be redundant.

Blowdown systems have two types of inputs: *episodic emissions* from pressure relief devices (PRDs) that vent into the blowdown systems and *periodic emissions* from cleaning and maintenance operations during shutdowns. Episodic emissions from PRDs are subject to the requirements of Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices in Petroleum Refineries and Chemical Plants. Periodic emissions from shutdowns, startups, cleaning and maintenance operations are subject to the requirements of various rules, most notably Regulation 8, Rule 10: Process Vessel Depressurization, or Regulation 8, Rule 2: Miscellaneous Operations. Because inputs to atmospheric BDSs are already fully regulated, staff does not recommend new rulemaking to further control emissions from these systems.

## **II. BACKGROUND**

### **A. Description of Blowdown Systems**

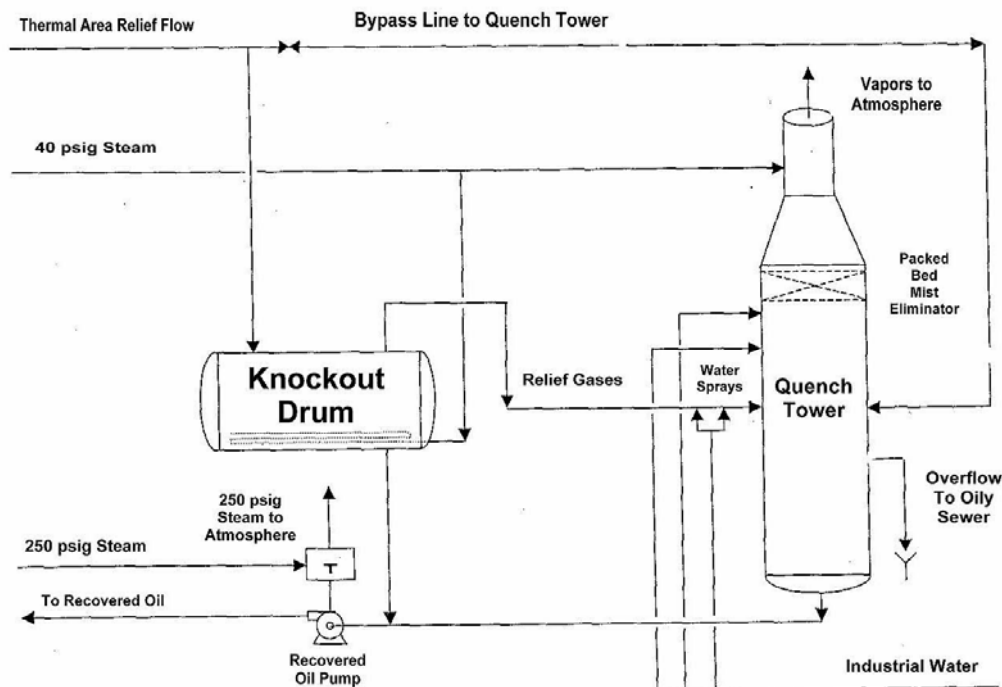
All process units in refineries can be expected to experience operational upsets that must be handled in a safe and effective manner. Upsets include instrument failures, loss of cooling water, loss of steam, loss of power and a number of atypical operating conditions. In order to protect process vessels from over-pressurization and rupture during upsets, vessels are equipped with pressure relief devices (PRDs) so that gases and fluids can be released safely. PRDs may vent directly to the atmosphere or to a blowdown system. BDSs provide for the safe disposal of hydrocarbons, liquids and gases that are either automatically vented from the process component through PRDs or manually drawn from units using control valves or block valves. The BDSs separate liquids from vapors and recover any condensable oil and water. Gases in the typical blowdown system are then sent to fuel gas recovery, or to a flare.

There are many BDSs at refineries operating in the District. Only four of the BDSs are vented to the atmosphere; all four of these atmospheric blowdown systems are located at the Tesoro Refinery in Avon, California near Martinez. Relief flows from PRDs and process vents, including high pressure steam, are

plumbed to atmospheric BDSs. Other materials that can enter a BDS include industrial water, steam, gasoline and diesel fuel used to clean out process vessels during maintenance. Process units are typically purged to the BDS during shutdown and prior to startup. The separated vapors are usually combined with high pressure steam to prevent the potential for explosive or combustible concentrations of hydrocarbons, and then released to the atmosphere. This provides for some reduction in emissions.

Figure 1 is a simplified flow diagram of one of the four atmospheric BDSs. Each of the four BDSs is unique.

**Figure 1**  
**Atmospheric Blowdown System**



Each atmospheric BDS services a different section of the Tesoro Refinery: Crude Unit 50, Crude Unit 3, the Fluid Catalytic Cracking Area, and the Coker Area. The Crude Unit 3 blowdown system is shown in Figure 2. In each of the four areas, relief gases are transported to the top of a knockout drum. Typically, there should be no flow to the drum. Flow should only be present during startup, shutdown, or upset conditions. The purpose of the knockout drum is to separate gases from liquids. Liquids fall to the bottom and are manually pumped to tanks for reprocessing. There are a number of ways an operator determines that flow is present, including communication with refinery staff, high temperature, high pressure, spray flow alarm, or high level alarm.

Knockout drums on two of Tesoro's atmospheric BDSs have a steam coil. The steam coil keeps heavy hydrocarbons fluid. Vapors and mist exit the top of the

drum and proceed to the side of the quench tower. Water sprays are used to remove condensable hydrocarbons, which fall to the bottom of the quench tower. The liquid hydrocarbons overflow to the oily sewer, where they are separated for reprocessing and wastewater treatment. The remaining vapors exit through the top of the tower. Steam flows into the stack to prevent air from entering and creating an explosive mixture.



**Figure 2: Crude Unit 3 Blowdown System**

### **III. REGULATORY HISTORY**

#### **A. Further Study Measure 8 (2001 Ozone Attainment Plan)**

In the 2001 Ozone Attainment Plan the District discussed the need to study whether regulatory controls for blowdown systems should be implemented (Further Study Measure 8; Pressure Vessels, Blowdown Systems, and Flares). With regard to BDSs,<sup>1</sup> the study was intended to evaluate the volume of gases sent to atmospheric BDSs and the contribution of pressure relief devices (PRDs) to these flows. The study was also intended to consider, as appropriate, the feasibility, cost and safety of emissions reductions by reducing flows to BDSs.

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<sup>1</sup> The other commitments discussed in the 2001 Ozone Plan FS-8 have been or are being addressed through other control measures. These include adopted Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries and Regulation 12, Rule 12: Flares at Petroleum Refineries and proposed amendments to Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants.

## **B. 2002 Pressure Relief Valve Audit**

In 2002, the District audited pressure relief devices at all five Bay Area refineries to determine compliance with Rule 8-28 and to make recommendations for rule improvement. The findings of the audit directly relate to blowdown systems for the pressure relief devices that vent into the blowdown system. The District is currently developing proposed changes to Rule 8-28, accessible at <http://www.baaqmd.gov/pln/ruledev/workshops.htm>, which apply to all PRDs including those that vent to blowdown systems.

## **C. 2002 Technical Assessment Document**

In 2002, the District released a draft Technical Assessment Document (TAD) to address emissions from blowdown systems. The TAD calculated emissions from an incident in May, 2001 to determine a range of flow rates from the BDS and estimated emissions using an EPA AP-42 emission factor. As explained below, use of this emission factor significantly overstated emissions from these BDSs. The TAD stated that emissions from blowdown systems could be reduced by prevention measures or control measures such as venting emissions sources into an abatement device. The TAD recommended monitoring for each blowdown system. The TAD can be reviewed on the District's website at: [http://www.baaqmd.gov/enf/further\\_study\\_measures/flares/blowdown\\_tad\\_draft2\\_dec2002.pdf](http://www.baaqmd.gov/enf/further_study_measures/flares/blowdown_tad_draft2_dec2002.pdf).

# **IV. SUMMARY OF TECHNICAL REVIEW**

## **A. Emissions**

The typical source of emissions from blowdown systems is a pressure relief device. One or more PRDs that feed into the BDS may experience a release to relieve an over-pressure situation, or an improperly reseated PRD may leak emissions into the BDS. These are *episodic* emissions. Other causes of emissions to the BDS are processes that occur intentionally but are not part of the normal refinery operation, such as a shutdown or cleaning or maintenance when valves are manually opened. These are *periodic* emissions. The 2002 Blowdown System TAD estimated that the emissions average seven tons of organic compounds per day from the four Tesoro BDSs, but this value is misleading and should be clarified.

The TAD estimate was based on EPA emission factors and assumed flow rates that are atypical. The emissions calculation assumed that 15 percent of the refinery feed (crude oil) emissions go to the atmospheric blowdown systems. The EPA factor for blowdown systems, 580 pounds of emissions for each 1000 barrels crude oil processed, assumes the blowdown systems are uncontrolled. However, in the EPA emission factor, "uncontrolled" means that not only the blowdown system itself is uncontrolled or atmospheric, as are Tesoro's BDSs, but that the input streams are not controlled by PRDs or manual valves. The EPA factor, therefore, is not applicable to these blowdown systems. The TAD

also estimated flows of 1 to 5 million cubic feet per day, based on a single incident that occurred in 2001. Flow rates are more typically non-existent, unless, as mentioned above, pressure is being relieved or there is some process where valves are intentionally open, such as vessel depressurization or cleaning. In addition, there exists the possibility of a leak into the BDS from a valve left open or where there is some valve failure.

The TAD also relied on District source test data for an incident that occurred over a five day period from June 16 through 21, 2002. During this incident, the #50 Crude Unit was pressurized and de-pressurized three times with nitrogen as part of unit start-up. During that time, it was discovered that a check valve, not normally opened, had failed, resulting in hydrocarbon emissions that were detected during the source test. Use of emissions data from this atypical event provides an inflated picture of normal blowdown system emissions. Neither the forced flow from nitrogen pressurization and de-pressurization nor the check valve leakage is a normal operating condition.

Other source tests conducted at Tesoro during the past three years have been unable to detect any flow coming out of the blowdown systems. The District monitored the blowdown system serving the #50 Crude Unit from February 5 through December 19, 2003. During that time, with the exception of fewer than five hours in total, the monitoring equipment was unable to detect any flow.

## **B. Characterization of Input Streams**

Staff reviewed piping and instrument diagrams for the four atmospheric BDSs located at the Tesoro Refinery. The diagrams indicate that there are 167 uniquely identified streams plumbed into the four BDSs. Forty-two of the streams are dedicated solely to PRDs. The table in Appendix 1 summarizes the types, source, quantities, and characterization of the identified input streams for the four BDSs at Tesoro.

The table provides an estimate of emissions from blowdown systems for each type of event. As previously described, there are not normally flows to (or, therefore, emissions from) the blowdown systems. There have been eight PRD releases into the blowdown towers since July, 1998 (when reporting of PRD releases became mandatory under Regulation 8, Rule 28). The emissions from these episodic releases are subject to the provisions of Regulation 8, Rule 28 and totaled 26.3 tons.<sup>2</sup> Periodic emissions from cleaning and maintenance activities, or from depressurization when manual valves are opened into the BDSs, can be calculated from the concentration of gases or the vapor pressure and quantities of liquids in the BDS before being drained into slop oil vessels. For example, the VOC emissions from 20 barrels of gasoline in a BDS totaled

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<sup>2</sup> 50 Crude Unit, seven releases, 377 lbs; Coker, one pre-turnaround release, 16 tons; three post-turnaround releases, 20,212 lbs; #3 Crude Unit and Cat. Cracker, no releases. Regulation 8, Rule 28 required the implementation of measures to prevent PRD releases at the first refinery turnaround after July 1, 1998.

2.81 pounds. The emissions from 20 barrels of diesel totaled 0.014 pounds VOC.<sup>3</sup> These amounts might be used to clean process vessels as described in the Appendix table. The table also lists materials, amounts and frequency of use for various maintenance operations. These emissions are likely overstated, as they do not account for any cooling effect from the quench towers or packed bed mist eliminators in the blowdown systems. The episodic and periodic natures of emissions from blowdown systems do not lend themselves to an annual average calculation expressed in terms of tons or pounds per day.

### **C. Rules Affecting BDS Input Streams**

Emissions from PRDs, whether vented directly to atmosphere or to a BDS, are regulated by Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants. Similarly, any fugitive leakage of hydrocarbons past PRDs would be subject to the requirements in Regulation 8, Rule 18: Equipment Leaks. Input streams to Tesoro's atmospheric BDSs that are not controlled by PRDs are controlled by manual valves. These are used during shutdowns and maintenance. Regulation 8, Rule 10: Process Vessel Depressurization applies during the shutdown of a pressure vessel. Once a valve is opened and a process component is flushed into the BDS with steam and/or diesel, the operation is subject to the provisions of Regulation 8, Rule 2: Miscellaneous Operations. Table 1 summarizes District rules applicable to BDS input streams. It must be noted that more than one rule may apply to a single input stream depending on the nature of the emissions and source. For example, one input may originate from a process vessel that may be depressurized only once every few years. Emissions from the depressurization would be regulated under Rule 8-10: Process Vessel Depressurization. However, if material leaks past the valve that controls the depressurization, then those fugitive emissions would be regulated under Rule 8-18: Equipment Leaks.

**Table 1**  
**District Rules Applicable to Blowdown System Input Streams**

<b>District Rule</b>	<b>Description</b>
Rule 8-2: Miscellaneous Operations	Limits organic emissions from miscellaneous operations to no more than 300 ppm concentration and 15 lbs per day.
Rule 8-10: Process Vessel Pressurization	Prohibits opening pressurized vessels until pressure is less than 1000 mm Hg pressure (4.6 psig) and organic compound concentration less than 10,000 ppm before being opened.
Rule 8-18: Fugitive Emissions	Applies to fugitive emissions from valves, pumps, compressors, pressure relief devices and other refinery components. The rule sets emission standards for each category and allows a small fraction of leaking components to be placed on a "non-repairable" list provided the leak is less than 10,000 parts per million on a volume basis (ppmv).

<sup>3</sup> Assumes 90°F and that 20 barrels of liquid fully displaces the equivalent volume of vapors.

District Rule	Description
Rule 8-28: Episodic Emissions from PRDs	Regulates emissions from pressure relief devices (PRDs) at refineries and chemical plants. The rule requires that PRDs be equipped with a telltale indicator following one "Release Event" (10 pounds or more of VOC). Control is required for all PRDs on a process unit following the second release event within five years on that process unit. Rule 28 is concurrently being considered for amendment.

#### **D. Controls for Blowdown Systems**

Blowdown systems could be further controlled in various ways, although doing so would not be a simple matter. A pressure relief device that vents into a BDS could theoretically be routed to a control system such as a flare or fuel gas recovery system. Tesoro has been able to control a select group of PRDs by venting them into an existing fuel gas recovery system. However, there are significant difficulties to be overcome for either of these control options. Atmospheric blowdown systems are designed to operate at or near atmospheric pressures, as are the input streams that feed into the BDSs. In order to control these systems by routing them to a flare or fuel gas recovery system, the pressures at which this equipment typically operates would have to be adjusted so that back pressure associated with the control system would not over-pressurize and potentially damage the equipment. The components that operate at atmospheric pressure, such as the manual valves serving drains and pumps, could not be routed to a flare or fuel gas system without additional equipment such as pumps or compressors to increase the pressure of these streams. More likely, the blowdown units would have to be completely scrapped and another system designed and constructed.

It may be possible to isolate PRDs and route those to a control device without controlling the atmospheric BDSs. The costs of such an approach would be consistent with the cost estimates for controlling pressure relief devices. This is a control option that was considered as part of the larger PRD regulation. Amendments to Regulation 8, Rule 28: Episodic Pressure Relief Devices at Petroleum Refineries and Chemical Plants are currently being considered. Information concerning the draft amendments can be found on the District's website at <http://www.baaqmd.gov/pln/ruledev/workshops.htm>.

### **V. SUMMARY OF PUBLIC CONSULTATION PROCESS**

#### **A. Meetings**

Blowdown systems, because of their intimate relationship with pressure relief devices, have previously been discussed concurrently with other work on Further Study Measure 8 concerning flares and pressure relief devices. In June, 2003, the District Board adopted new Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries. A workgroup was initiated in January, 2002 to provide technical assistance in developing that rule. During workgroup meetings to

develop Reg. 12-11, it was decided that splitting FS-8 into separate technical assessments was most efficient, in part because atmospheric BDSs are only found at one refinery.

The Technical Assessment Document was distributed and posted to the District's web site in December, 2002. No comments on the TAD were received.

Following the District's investigation of inputs to the four blowdown systems at Tesoro, a workgroup meeting was held on September 15, 2005. Preliminary results were presented and the question of the need for a separate regulation specifically targeting BDSs was discussed. As mentioned above, the question of regulation of BDSs is inextricably tied to the question whether PRDs should be controlled to a more stringent standard than is required in the current Regulation 8, Rule 28. Much of the discussion at the BDS workgroup meeting focused on that issue. This document and recommendation reflect the input staff received during that workgroup meeting.

A public workshop to receive comment on the proposal was held on Thursday, October 27 in Martinez, near the Tesoro refinery. At that time, the public was given opportunity to comment on the staff's determination that a separate regulation addressing emissions from atmospheric blowdown systems is not necessary or appropriate at this time. Following the public workshop, there was a seven day comment period.

## **B. Responses to Public Comments**

This section presents a summary of the public comments that were received during the workgroup meeting, public workshop, or as part of the public consultation process. The District received written and oral comments from one source: representatives of Communities for a Better Environment (CBE).

Comment: The District did not set the condition for meaningful comments. CBE asserts that staff did not allow CBE adequate time and access to information for CBE to provide meaningful comments on the staff's conclusion that further regulation of BDSs was unnecessary. When CBE requested data to substantiate staff's conclusion, staff directed CBE to gather the information directly from Tesoro, which was never made available.

Staff Response: Except for the confidential information submitted by Tesoro during the investigation undertaken by the District for the BDSs portion of Further Study Measure 8, all data and information relied on by staff was available as part of the public process for consideration of this potential control measure. This included emissions data and summary information that characterizes the input streams all of which was set out in the September 30, 2005 Workshop Staff Report.

Staff did not provide CBE the piping and instrument diagrams of the four BDSs submitted by Tesoro as requested because the company had designated that

information proprietary. Staff did, however, make available as part of the public workshop materials a detailed summary of the confidential information submitted by Tesoro. Additionally, during the workgroup meeting, Tesoro agreed to work directly with CBE to provide additional data to supplement the basic summary distributed at that meeting. Upon receipt of this comment, staff made inquiries of both parties and worked to facilitate the exchange of information.

Comment: CBE asserts that none of the four rules referenced in the BDS Staff Report explicitly or clearly applies to BDS.

Staff Response: All inputs to the BDS are subject to one or more different rules depending on the source of emissions. The rules iterated, 8-2, 8-10, 8-18, and 8-28, apply to different emissions at different times, but together, leave no emission unregulated. Regulation 8-2 is a miscellaneous standard for emissions not covered by other rules. Regulation 8-10 specifically limits emissions from opening of pressure vessels during maintenance operations, Regulation 8-18 limits fugitive emissions from valves and other equipment connections, and Regulation 8-28 addresses emissions from pressure relief devices, including those opening into the blowdown system.

Comment: CBE asserts that staff previously stated that it would address BDSs in a PRD rule, but it does not do so in the currently proposed PRD Rulemaking.

Staff Response: In the 2001 Ozone Attainment Plan, Further Study Measure 8, the District discussed the need to "...examine the blowdown system for each of the Bay Area refineries to determine whether there is potential for significantly reducing emissions by reducing routine flaring and by venting more pressure relief valves (PRVs) to gas recovery systems, with flares used only for emergency events." Thus, originally, FSM 8 covered flares, PRDs and BDSs as sources of episodic emissions that should be considered as a source of further controls. Ultimately separate TADs were prepared for each "system" but they are clearly facets of an interrelated system that is a source of (primarily) episodic emissions. The current PRD rulemaking does not address BDSs directly but it does address the primary input to BDSs and in that context will certainly control a significant portion of the emissions vented through these systems.

Comment: BDSs themselves would not be monitored. Although staff proposes to measure or calculate the emissions for the inputs to the BDS, the Staff Report does not describe even generally how this would be accomplished. The Report neither discusses the significance nor presents data on each stream going into the BDSs.

Staff Response: It is true that at the initiation of this evaluation, BDS were not equipped with permanent monitoring devices. However, all four BDSs are currently equipped with flow meters. Under Regulation 8, Rule 28, the facility is required to quantify emissions from a PRD release event (accurate to two significant figures). Emissions quantification for Rule 8-28 is often based upon engineering estimates of the equipment from which the release occurred, and, in

the proposed Regulation 8-28 amendments, refineries will be required to demonstrate their capability to accurately quantify a release. The flow monitors will assist in quantifying emissions and enforcing the other applicable rules, particularly Regulation 8-2: Miscellaneous Operations. Regulation 8-2 requires compliance with an emission standard of 15 lbs organic compounds a day as well as a concentration limit of 300 ppm. Based on the material emitted and measured flows, these parameters (concentration and pounds) can be determined.

Comment: The Report contains discrepancies that are not fully explained, including emissions estimates from the Blowdown System TAD of seven tons per day. The Staff Report states that this number is overestimated. However, there is no information as to whether the monitoring was based on calculations or measurements, or whether the monitoring was continuous or conducted in a manner that can be expected to represent emissions accurately. Most importantly, the monitoring focused on the regularity with which flow was detected rather than on the significance of the amount emitted. The TAD stated that information was insufficient to draw a conclusion. However, staff now has drawn a conclusion based largely on that same data. More information is needed to draw such a conclusion.

Staff Response: The Report clearly explains why the seven tons of emissions presented in the TAD was overestimated. Further, additional data have been generated since the TAD was published and that data were presented in the Workshop Report. Specifically, that report included information on ten months continuous monitoring in which no flows were detected with the exception of a five-hour period. The report also includes descriptions of specific incidents that occurred at the individual BDSs and the reasons for the emissions. Staff also evaluated each of the input streams to characterize the stream and their potential for emissions. Based on all of this information, staff concluded that additional rulemaking is unnecessary.

Comment: The District has ducked its obligation to evaluate BDSs. In the settlement agreement, the District specifically commits to evaluate controls of uncontrolled BDSs. "For refinery blowdown systems, in addition to the description identified in Further Study Measure 8, the District will evaluate the potential for control of uncontrolled refinery blowdown systems."

Staff Response: Staff did evaluate the potential for control of uncontrolled refinery blowdown systems for purposes of reducing ozone. This is a multi-pronged evaluation that looks at a number of factors. The evaluation performed by the District is described in this Report. The primary conclusion reached by staff in preparing its recommendation not to undertake additional control of the four atmospheric blowdown systems at Tesoro for purposes of controlling ozone precursors was the finding that all of the inputs to these systems are controlled by an existing District rule. The primary input is episodic releases from PRDs. The District is considering amendments to that regulation, which will affect the input to the BDSs. Other inputs are far less significant and they are also subject

to existing District rules. The conclusion dictated by this part of the evaluation that a second level of controls for the sources that vent to an atmospheric BDS, as opposed to simply venting to atmosphere, found additional support when District staff considered that the significant technological challenges attended to controlling the atmospheric BDSs at Tesoro.

## **VI. EXPLANATION FOR NOT PROCEEDING WITH RULEMAKING AT THIS TIME**

The inputs that are responsible for emissions from atmospheric blowdown systems are subject to existing District regulations. Regulation 8, Rule 28, requiring control of all pressure relief devices on any process unit that vents twice is the most stringent rule of its sort in existence, and one of only two to control episodic PRD releases in California. Regulation 8, Rule 10 was amended in January, 2004 to establish more stringent standards to reduce emissions from vessel depressurization, and Regulation 8, Rule 18 is the most stringent rule regulating fugitive emissions in the United States. Finally, Regulation 8, Rule 2 controls emissions from miscellaneous operations such as flushing diesel into the blowdown tower during cleaning and maintenance and also would limit emissions in the event of a valve left open inadvertently. Atmospheric BDSs do complicate enforcement of the requirements for the various inputs to the system. However, proper monitoring of emissions by measurement of flows and measurement or calculation of hydrocarbon concentration provides sufficient means to enforce these rules.

Staff has determined, therefore, that a second level of regulatory control, i.e., controlling emissions from atmospheric BDSs, which receive only regulated inputs, is not warranted under existing circumstances. Therefore, staff does not propose to undertake additional rulemaking related to atmospheric BDSs at this time.

# APPENDIX 1

## Characterization of the Various Input Streams to Atmospheric Blowdown Systems

Source	No. of Inputs	Material in Stream	Total Amounts	Conditions of Use	Access to Blowdown
PRDs	(42)	Hydrocarbons	Varies	Process Upset	PRD
Heat Exchanger Drains (83)	(29)	Slurry, heating oil, Product Feed, Light gas oil, Gasoline, Steam, LPG, Decant Oil	170 - 11,575 gal	Shutdown	Manual valve
	(33)	Diesel	66 bbls	Clean & repair, once each 6 yrs	Manual valve
	(19)	Gasoline, steam & water	2-42 bbls	Clean & repair, once each 3 yrs	Manual valve
	(1)	Steam / water	10 bbls	Never	Manual valve
Pumps / Compressors (5)	(1)	Glycol / Gasoline	1 gal/min	Flushing following emergencies – inner seal failure	Manual valve
	(2)	Decant Oil / gasoline	5 -25 gal	Flushing during Shutdown	Manual valve
	(1)	Gasoline vapor Gasoline liquid	5 cf 10 gal	Intermittent flushing	Manual valve
	(1)	Slurry HGO	0 gal 0 gal	Shutdown (not used)	Locked closed
PRD Flush	(1)	Diesel	10 bbls	Flushing following episodic PRD lift	Manual valve
BDT level glass flush Line	(2)	Wash oil	0	Used to flush BDT level glass	Manual valve, locked closed
Valve Flush (2)	(1)	Slurry (15 gal) LGO (45 gal)		Shutdown	Manual valve
	(1)	LGO (0 gal)	0	Shutdown – never used	Locked closed
Vessels (3)	(3)	Foul water / LPG	0	Not used	Locked closed
Blowdowns (from PRDs)	(2)	n/a	0	Never used	Double blocked valves -- locked closed
Fractionator	(1)	n/a	0	Never used	Manual valve, locked closed
Vent (8)	(1)	Gasoline / LPG	15 MMSCF	Emergencies – high accumulation & flare pressure	Manual valve
	(1)	Steam	4000 scf	Turnaround, once each 6 yrs	Manual valve
	(3)	Crude, gasoline	20-200 bbls	Clean & repair, once each 3 yrs	Manual valve
	(2)	Gasoline	20 bbls	Shutdown & startup, once each 6 yrs	Manual valve
	(1)	Various Light materials		Normally to flare. Has tie into blowdown – not used	Locked closed
Condensate	(2)	Steam condensate	100 – 200 lbs/hr	Intermittent	Manual valve
Drain (Purge gas)	(2)	Natural Gas	8-10 lbs	1 / 2 days	Manual valve
Drain (steam line)	(1)	Steam condensate	0 -10 Mlb/hr	Startup – 1 / 2 yrs	Manual valve
Drain (PRD)	(2)	Gasoline	80 bbls	Following PRD lift	Manual valve
Drain (valve)	(2)	Water / liquid	4 gals	2/yr	Manual valve
Outlets	(4)		25-90 bbls	Shutdown & startup, twice in 3 yrs	Manual valve
		Gasoline			
Coil Outlet	(3)	Diesel	60 bbls	Shutdown & startup, twice per year	Manual valve
Flare Header	(1)	HC Gas	0	Never used	Locked closed
40# Steam	(1)	Steam	0.5 – 30 Mlbs/hr	Continuous minimum flow	open
250# Steam	(1)	Steam	0	Never used	Locked closed